WFD-27 Wi-Fi/DCC Trackside Command Station/Booster

Operating Manual

The WFD-27 firmware has been updated. Please click on the following link to access the latest 2.0.0 version of the WFD-27 Manual: http://www.wifitrax.com/manuals/WFD-26-27-28/WFD-26-27-28-Manual.pdf

This current document applies only to versions of WFD-27 with firmware than version 1.0.0 to 1.3.0. It is online at http://www.wifitrax.com/manuals/WFD-27/WFD-27-Manual.pdf. Please see our website for information on our limited warranty.

WifiTrax Model Science

www.wifitrax.com

Version 1.0 September 23, 2022

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This product is not a toy. Keep away from children. It is not suitable for use by persons under 14 years of age. In operation some parts may become hot to the touch.

WFD-27 Wi-Fi/DCC Trackside Command Station/Booster Operating Manual

Version History

Version	Changes
1.0	Initial Release

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WFD-27 Wi-Fi/DCC Trackside Command Station/Booster Operating Manual

Scope of this Document

This document describes detailed use of the WFD-27 Wi-Fi/DCC Trackside Command Station/Booster Module. For a simple starting guide, please see the leaflet at
http://www.wifitrax.com/appNotes/quickStart/WFD-27-Quick-Start.pdf

This manual applies to firmware version 1, (i.e., version numbers 1.X.X). Some features described may not be present in early versions.

What does WFD-27 Wi-Fi/DCC Trackside Command Station/Booster do?

The WFD-27 allows you to drive your DCC trains and control accessories from hand-held untethered controllers. It provides a DCC track output to power and control locomotives and accessories fitted with DCC decoders. It provides a program track output to program configuration variable (CV) values in DCC controllers.

- You can drive trains and control accessories using a smart phone or tablet as a hand-held throttle provided it has Wi-Fi capability and you have installed one of our recommended apps in Table 1.
- You can use a special-purpose hand-held throttle designed to control trains and accessories using the Hoffman WiThrottle protocol such as the UWT-100 from Train Control Systems (TCS).
- You can use a Windows or Apple computer, such as a laptop or desktop, with a recommended installed app from Table 1 to control trains and accessories.
- You can configure the WFD-27 and program CVs using its in-built web pages from one of the apps in Table 1 or from any web browser on a phone. Tablet or PC.
- Four throttles at a time can join the WFD-27 Wi-Fi Access Point, but you can up this limit to six using “Home Net Web Page” mode as described later in this manual.

You don’t need to install JMRI to use the WFD-27

If you have been using an app on your phone to drive trains, via a computer running JMRI, you can now bypass JMRI and connect your phone directly to the WFD-27.

What is WiThrottle protocol?

WiThrottle protocol is a set of commands and data formats, authored by B. Hoffman and used by JMRI, that allows devices such as iPhone, Android phones and tablets to control trains and turnouts through a WiThrottle server. It has become something of a standard and is used by other products. You can find technical information here:

https://www.jmri.org/help/en/package/jmri/jmrit/withrottle/Protocol.shtml

What is JMRI?

JMRI (Java Model Railroad Interface) is a system of computer programs and support software that can be installed on a computer to do many things with your model railroad including running trains, controlling turnouts and programming DCC decoders. JMRI provides a wiThrottle server to allow you to run trains from phones etc. You can learn about JMRI here:

https://www.jmri.org/

WFD-27 Connections and Indicators

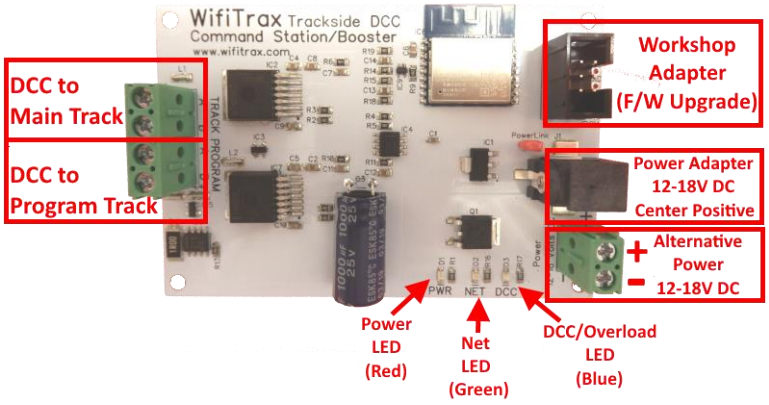


Figure 1 Connections on the WFD-27.

Figure 1 shows the WFD-27 module with its connectors labelled. There are two pairs of screw terminals on the left of the module. The upper pair in the diagram provide DCC to your main track. The lower pair supply a programming track. The connections to the track may be made either way around, since DCC is reversible.

On the right of the diagram, the upper 6-pin connector is for firmware upgrade. You can connect an FWA-20 Workshop Adapter here and use the Wifitrax Workshop software to upgrade firmware in the WFD-27 from the Wifitrax Support web site using a Windows computer.

The Power Adapter connector is used to connect a suitable mains adapter to power the module. Use a 12-18 V DC mains adapter rated at up to 6 Amp. The connector must be 2.5mm dia. pin, 5.5mm outer diameter, center positive. If you use a power supply rated at less than 6 Amp, it should have overload protection since the WFD-27 is designed to cut power to the track at 6 Amp and in such a case, the adapter will detect overload at lower currents than this. You can use a power supply rated at greater than 6 Amp in which case the WFD-27 will protect the track against short circuits on the track.

The screw terminals on the lower right can be used to supply power as an alternative to the power adapter. Again, the voltage and current requirements are as above. The power MUST be connected the correct way around. The module is protected against reverse connection, but will not operate in such conditions. If you use the Power Adapter to supply power, you can us these terminals as an output to supply other modules but be careful not to overload your power adapter.

LED Indicators

Red LED: The LED is illuminated when power is supplied to the module.

Green LED: When WFD-27 is in direct mode, the LED flashes when Wi-Fi traffic occurs. When WFD-27 is in home-net mode, the LED is illuminated constantly to indicate successful connection to your router. It will flash off briefly when Wi-Fi traffic occurs.

Blue LED: The LED lights continuously when the WFD-27 is supplying DCC to your track. It flashes if the WFD-27 goes into overload protection in the event of a short.

Let's get Started!

Connecting your new WFD-27 Command Station/Booster

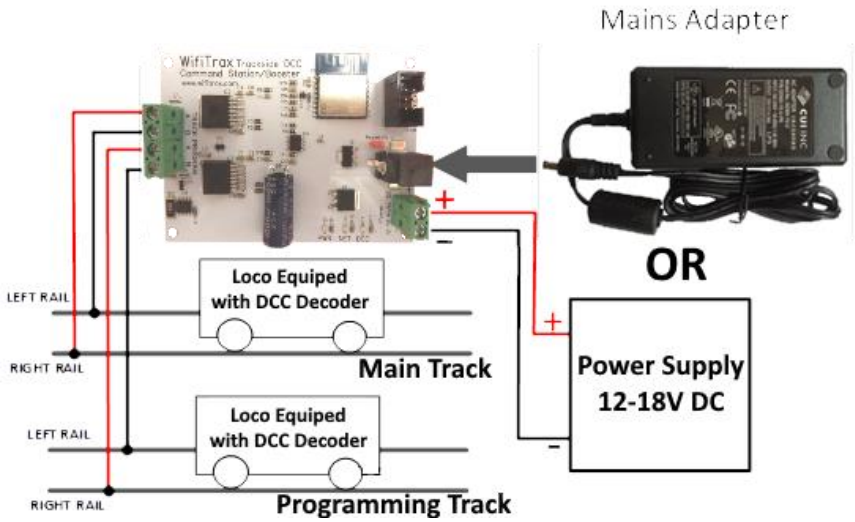


Figure 2 Connecting the WFD-27 Module to your Track and Power

(1) Mounting: Mount your WFD-27 Module in a convenient location where nothing metal will touch it, either in a plastic box or at a convenient location on your baseboard or fascia. Please see the "Mounting Suggestions" section. As a minimum, make sure it will not be dragged around by pulling on a connected cable and touch on some metal object. **Do not let the unit touch powered track or it may be damaged beyond repair!**

(2) Connect: Connect the Main Track outputs to the track of your layout. If the wires are long use a heavy gauge wire to avoid voltage losses due to the resistance of the wire.

Driving your First Trains

You can drive trains using any of the Apps in Table 1. WiThrottle and Engine Driver are apps that use the WiThrottle protocol and provide driving of trains, and control of accessories. The WFD-27 does not support routes, layout power or JMRI panels. You can also configure the WFD-27 using its Web Pages which are accessible using WiThrottle (Full Version) or Engine Driver or indeed any web browser via the device's default URL http://192.168.7.1

App Name	Author	Get From:	Windows 10	Android	Apple IOS	Notes	Advanced Features?
WiThrottle	Beth Hoffman	Apple App Store	NO	NO	YES		Via Web Pages
WiThrottle Lite	Beth Hoffman	Apple App Store	NO	NO	YES	No Accessories, No web page	Via Web Pages using Safari
Engine Driver	Steve Todd	Google Play Store	NO	YES	NO		Via Web Pages
Train Throttle	Drew Hoffman	Microsoft Store	YES	NO	NO	No Web Pages	Via Web Pages using Edge or IE

Table 1 Recommended Apps that work with the WFD-27

Getting Started with WiThrottle on Apple IOS

(1) On your iPhone, iPad or iPod device, make sure you are connected to the internet then go to the home screen and run the App Store app:

(2) Tap Search at the bottom right, type “WiThrottle” in the Search box at the top, tap the Search key, and tap either the Lite or full version, tap “Get” to download and install. This is a great app and the full version is well worth the small fee so we definitely recommend buying it! Don’t open the app yet.

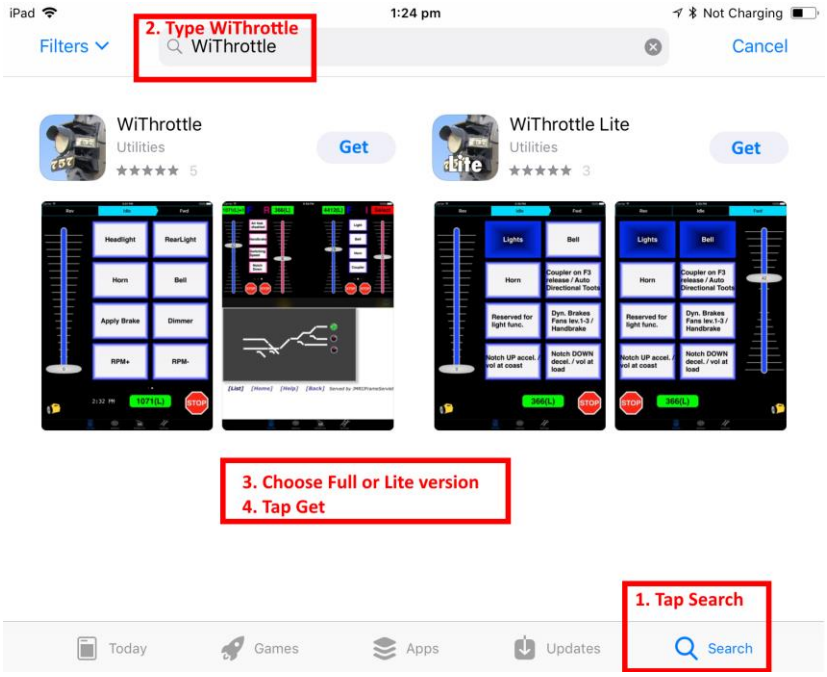


Figure 3 The Apple App Store page for WiThrottle

(3) Before opening the app, make sure your WFD-27 is connected, powered up and there is a locomotive on the track with a known DCC address. Both the red power LED and the blue DCC indicator LED should be alight.

(4) Now run the Settings app on your iPhone (or iPad etc.):

(5) Tap Wi-Fi on the left-hand menu. You should see a collection of available Wi-Fi Access Points on your right. Look for one that is of the form wftrx_WFD27_1_XXXXXXXX_7, where XXXXXXXX is the serial number of your unit that appears on its bag and the unit itself. Tap that Wi-Fi Access Point as Figure 4.

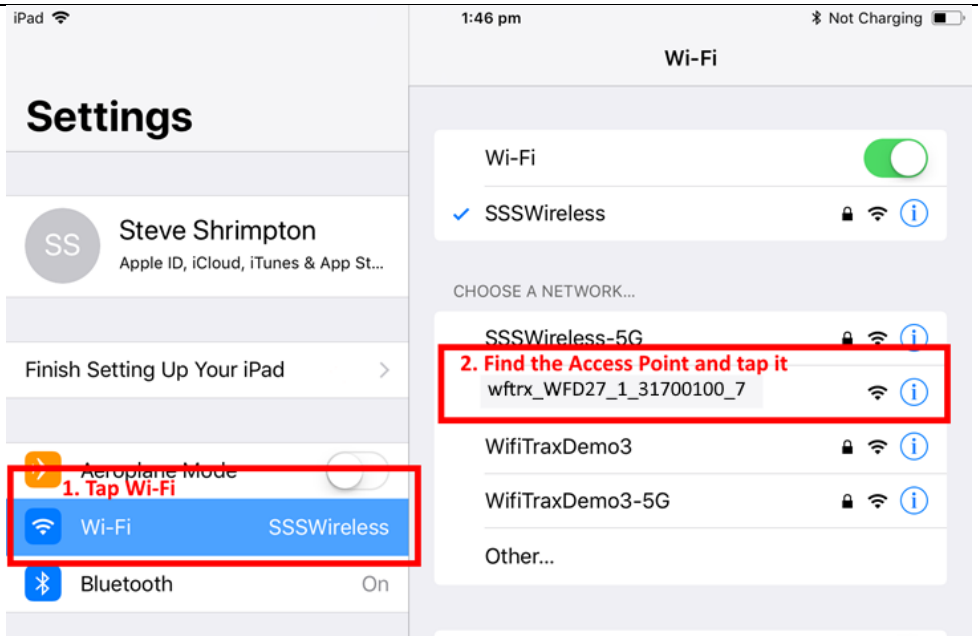


Figure 4 Connecting to the WFD-27 Wi-Fi Access Point

(6) No password is required and after a few moments you should see that it has connected as in Figure 5. The left-hand menu shows Wi-Fi wftrx_WFD27_1_XXXXXXXX_7. You will not be able to access the internet while you are connected to the Wi-Fi access point of the WFD-27, but consult the manual to find out how to put everything on your home network.

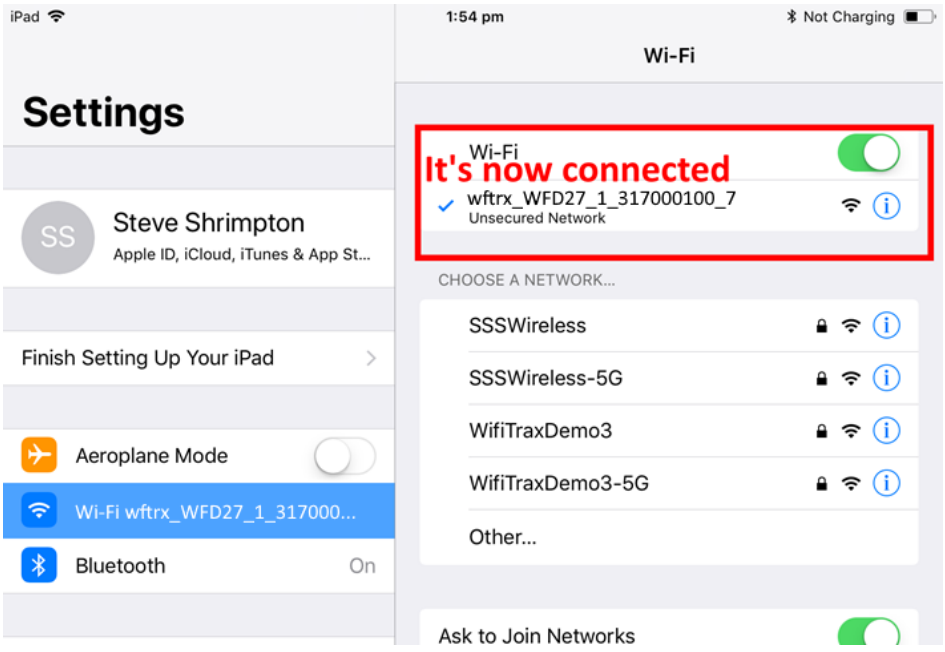
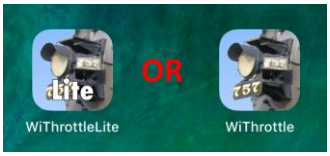


Figure 5 The iPad has connected to the WFD-27 Wi-Fi Access Point

(7) Go to the Home Screen and find and open the WiThrottle app by taping its icon:



(8) You should see the connection screen headed by "wftrx_WFD27_1_XXXXXXXX_7". The WFD-27 is a WiThrottle Server and it should appear in the "Available WiThrottle Servers" section, identified by its serial number. If it is visible, tap it as Figure 6. You may sometimes need to wait a few moments or go back to the home screen and tap the WiThrottle icon again.

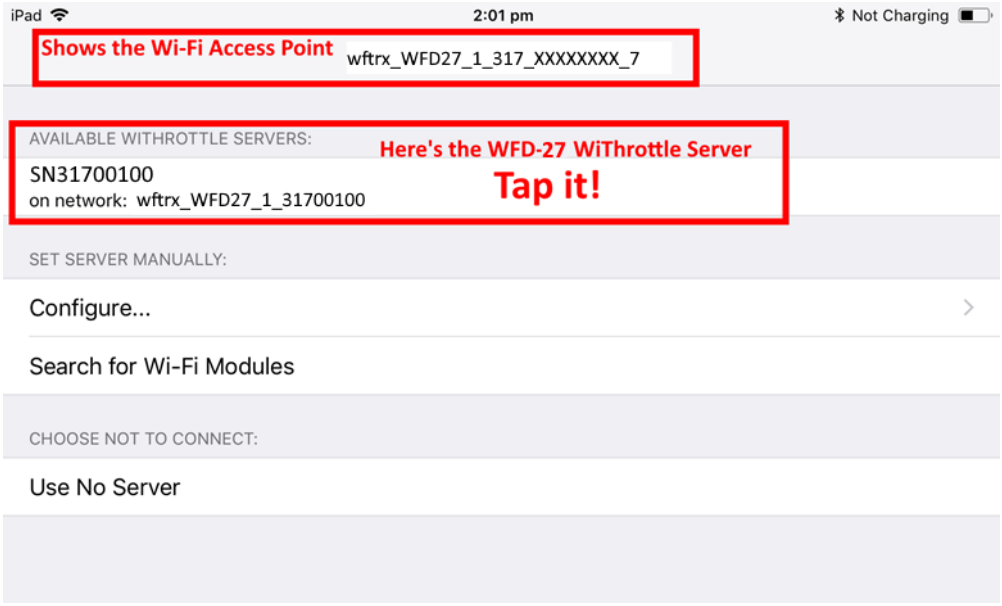


Figure 6 The WiThrottle app Server screen

(9) If for some reason there is nothing in the "Available WiThrottle Servers" list, tap "Configure" or "Search for Wi-Fi Modules" and follow a. or b below.

a. Configure: The WFD-27 always has the IP Address 192.168.7.1 on its own access point, so type this IP Address. Then type 12090 into the Port textbox and tap the Connect button as Figure 7. The green network LED on your WFD-27 should now flash regularly to show that the app is communicating with it.

b. Search for Wi-Fi Modules. The same as a. but IP Address and port are pre-entered, so just tap "Connect".

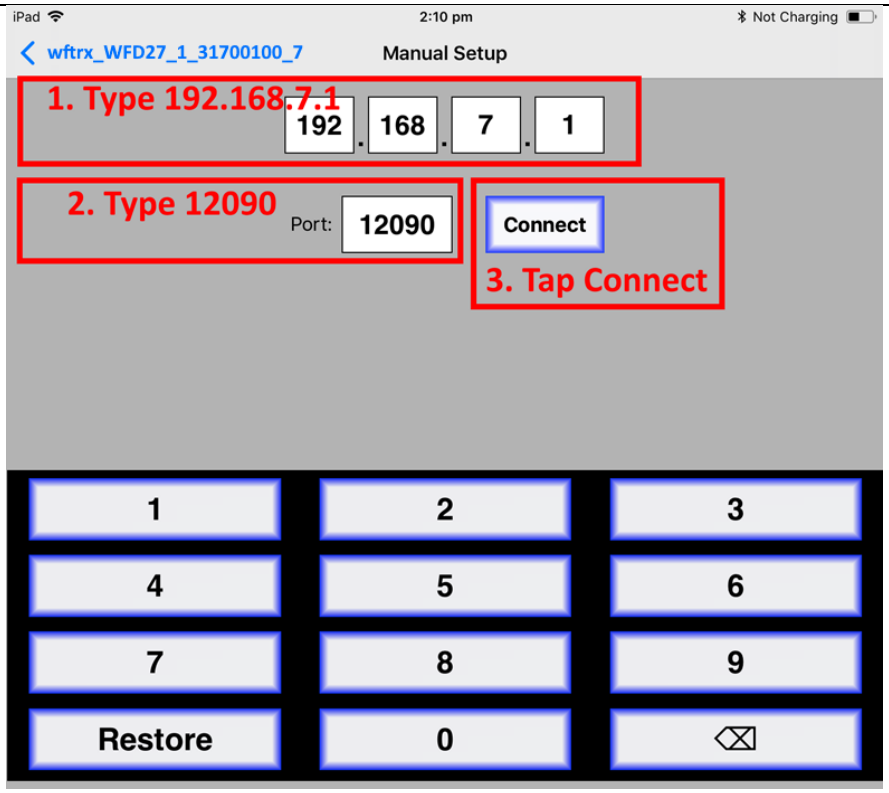


Figure 7 Connect manually if needed

(10)Now tap the "Address" tab at the bottom (it might go there automatically), tap Keypad and key in the DCC address of the locomotive that you wish to drive then tap the Set button as Figure 8.

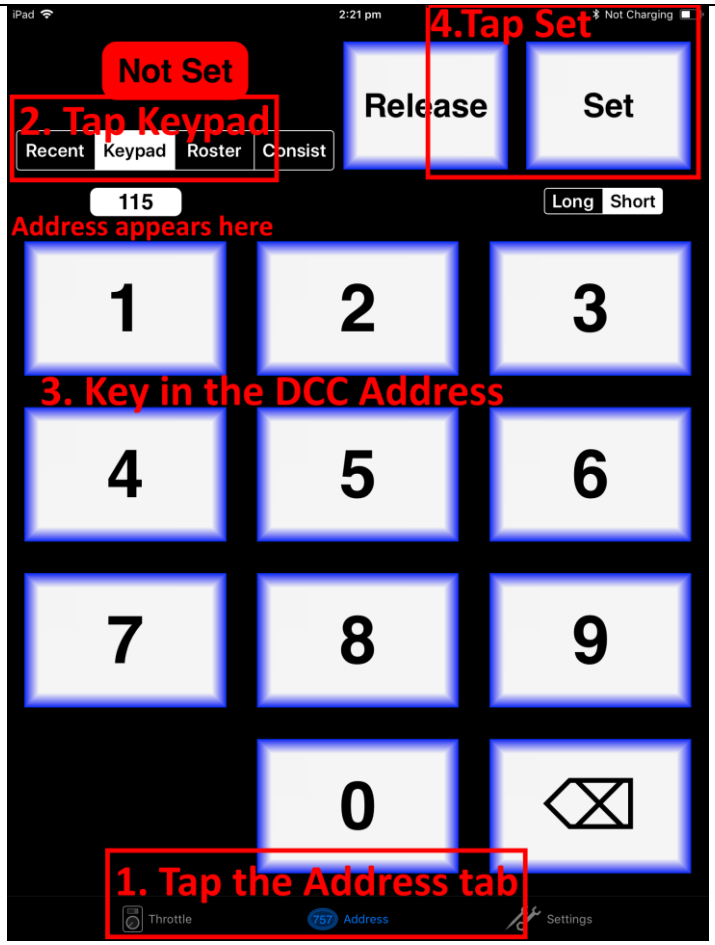


Figure 8 The Address tab of WiThrottle. Select a loco to drive

(11)The red button at the top left should turn green to show the loco is selected as Figure 9.

Figure 9 The loco is successfully selected

(12)Tap the Throttle tab at the bottom-left of the screen and you can begin driving as Figure 10. Each time you make a change to the locomotive's state, both the green network LED and the blue Cab Bus LED will flash.

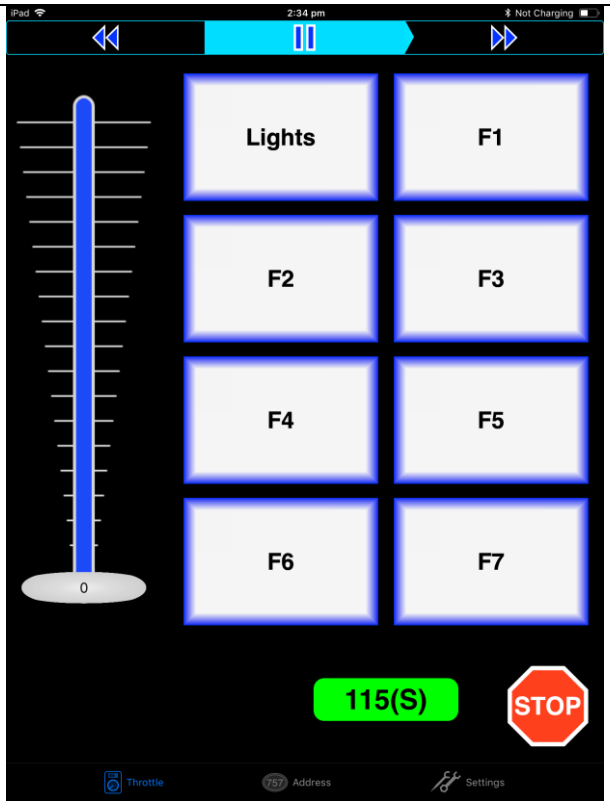


Figure 10 The WiThrottle "Throttle" screen

(13)Please consult the WiThrottle manual for more information. There are lots of screen options and some allow two locos to be driven at the same time. WFD-27 supports this. Go to:

https://www.withrottle.com/html/manual.html

Please note that WiThrottle, has many features that may vary according to the version that you install. WifiTrax has no control over the features of WiThrottle, but has tested carefully its operation with our product. If you have trouble working with WiThrottle and our module, please email us your problem rather than using the WiThrottle support. WiThrottle support persons are very helpful with WiThrottle features but may not know details of WifiTrax products, so please do not expect it. Support email: wifitrax@steveshrimpton.com or check our website.

Making it Easier Next Time

You can make connecting to the WFD-27 easier by setting your iPhone to automatically connect to the wftrx_WFD27_1_XXXXXXXX_7 access point whenever your system is powered up. Do this by going to the Settings page on your iPhone, connecting to the wftrx_WFD27_1_XXXXXXXX_7 access point, then tapping it. You will see a list of options. Make sure the Auto-Join option is enabled – the Slide Switch will be green. Then, when you turn on your railroad power, after a few seconds your iPhone will join. To make this reliable, you must disable Auto-Join on any other Wi-Fi Access points such as your home router. You can always enable it again when you have finished your model railroad session.

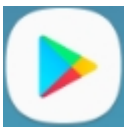
The WiThrottle app has an option “Use Automatic Network Configuration”. Set that to “on” and WiThrottle should connect automatically if your WFD-27 is powered up.

Use the recent option when selecting locos to save typing the DCC address each time, but please read the section “Locomotive Roster Web Page” to find out about defining rosters that you can pick from.

It is a good idea to always release locomotives before powering down your WFD-27. If for some reason you can’t select a locomotive, just restart the WiThrottle app by tapping its icon on the home screen.

Getting Started with Engine Driver on Android

(1) On your Android phone or tablet, make sure you are connected to the internet and run the Google Play Store app from the home screen:



(2) Search for Engine Driver by M. Steve Todd, download and install it. To do this:
   a. Tap in the "Search" Text Box at the top,
   b. Type "Engine Driver" into the text box and click the Search button, make sure the correct app "Engine Driver Throttle" displays as in Figure 11,
   c. Tap on the "Engine Driver Throttle app" (Figure 11). The app detail page displays.
   d. Tap the Install button (Figure 12). The app downloads and install on your device. Do not open the app until after the next steps.

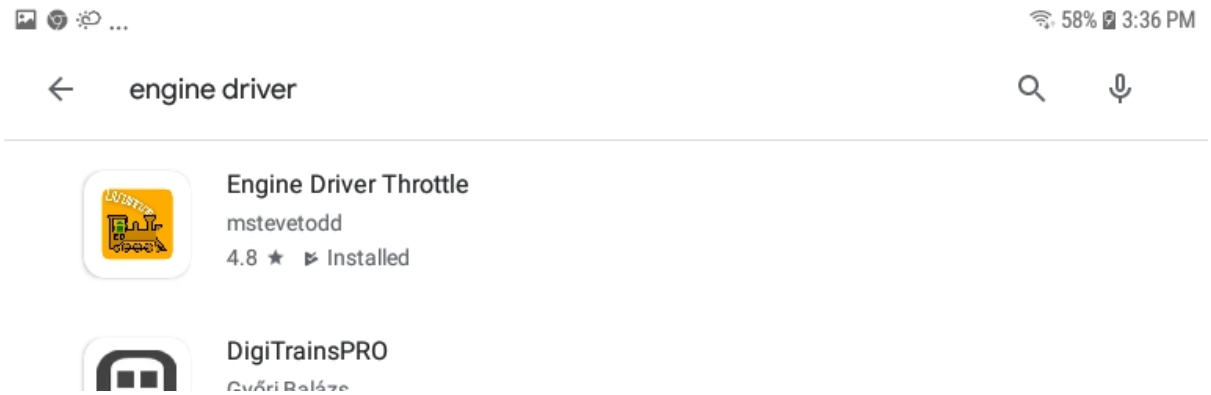


Figure 11 Searching for the Engine Driver app in Google Play Store

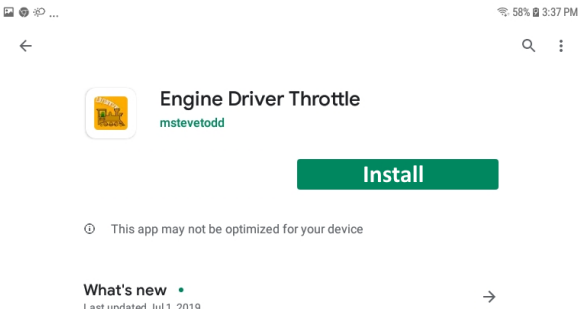


Figure 12 The Engine Driver Throttle detail page in the play store

(3) Make sure power is on, the WFD-27 is connected to the track and there is a locomotive on the track with a DCC address that you know. Both the red power LED should and the blue DCC indicator LED should be alight constantly.

(4) Tap the Home button, and run the settings app on your Android phone.

(5) Tap Connections on the left, then Wi-Fi on the right as Figure 13 (This may vary with different versions of Android).

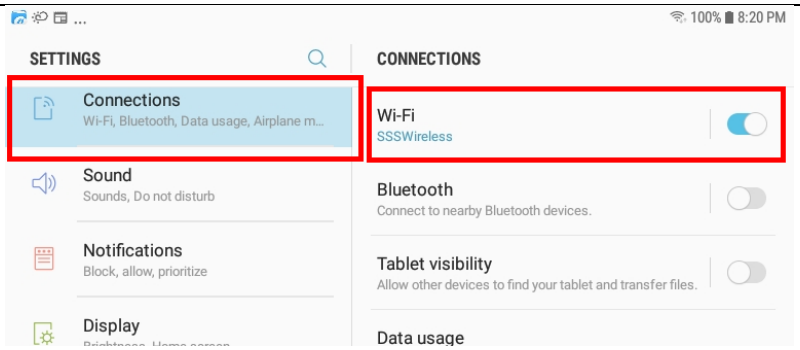


Figure 13 The Wi-Fi Connection page in the Android Settings app

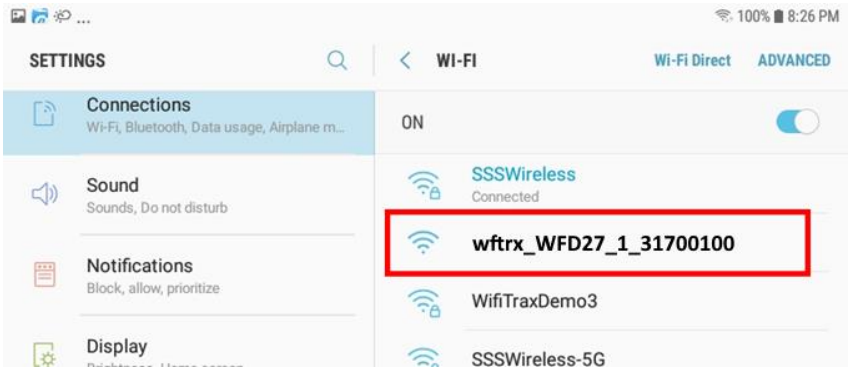


Figure 14 WFD-27 Wi-Fi Access Point is visible

(6) You now see a collection of available Wi-Fi Access Points. Look for one that is of the form wftrx_WFD27_1_XXXXXXXX_7, where XXXXXXXX is the serial number of your unit that appears on its bag and the unit itself, like Figure 14. Tap that Wi-Fi Access Point – no password is required – and wait for it to connect. You will not be able to access the internet while you are connected to the Wi-Fi access point of the WFD-27 but consult the manual later to see how you can put everything on your home network. After a few moments the Access point should show "Connected, no internet" as Figure 15

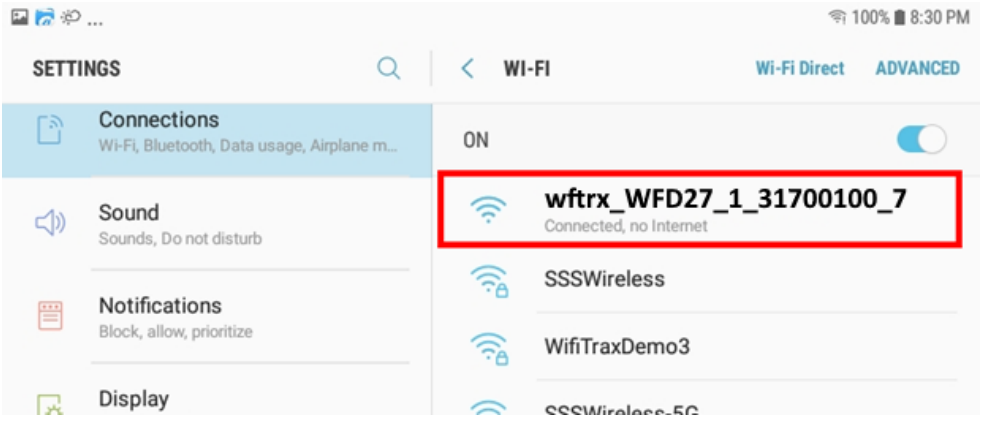


Figure 15 Connected to the WFD-27 Wi-Fi Access Point

(7) Now you can open the Engine Driver app that you installed. Do that by going to the Home Screen and clicking the Apps icon:

(8) On the Apps find the Engine Driver app icon – you may have to swipe right - (for convenience you could add a shortcut to your Home Screen), then tap it:

(9) Go through the setup sequence, accepting all the defaults and allowing the required privileges.

(10) After setup, you should see the "Connect to Server" page with your WFD-27 listed as a "Discovered Server" as Figure 16. Tap on it to connect. The green network LED on your WFD-27 should now flash regularly to show that the UWT-100 is communicating with it.

Figure 16 The WFD-27 WiThrottle Server is discovered by the Engine Driver app on Android

(11) **Only if the WFD-27 is not discovered** for some reason, after waiting a few moments, you must type the IP Address of the WFD-27 unit always 192.168.7.1 in the "Server Address" box at the top-left and the port value of 12090 in the port textbox as Figure 17, then tap the "Connect" button.

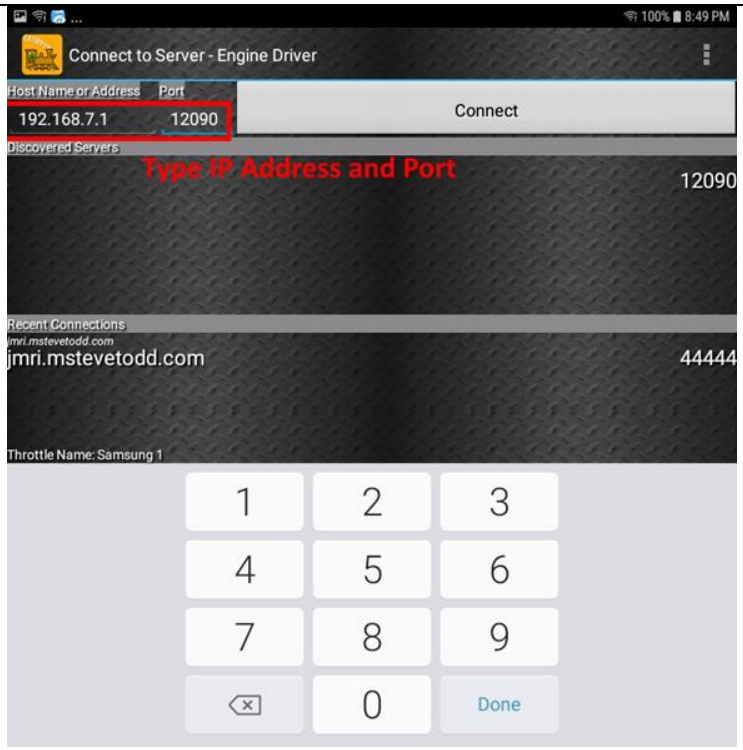


Figure 17 Connecting manually to the WFD-27 WiThrottle Server

(12)The Throttle screen should then appear, ready to select a loco and drive. Tap the Select button, check the "DCC Address" option and type the address of your locomotive either short or long as in Figure 18. Tap Acquire.

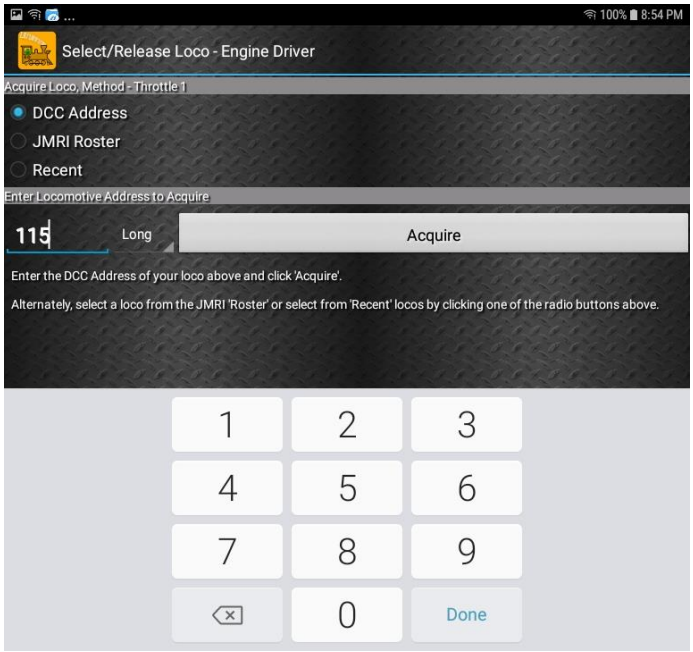


Figure 18 Selecting a locomotive by typing its DCC Address

(13)Now the Throttle screen appears with your DCC address as the selected loco as Figure 19. Try the function buttons and throttle slider to make sure your loco responds. Each time you make a

change to the locomotive's state, both the green network LED and the blue Cab Bus LED will flash.

Figure 19 The Throttle screen of Engine Driver with a locomotive selected to drive

(14) Engine Driver has many better screen options than the basic one in Figure 19. Please consult the Engine Driver "About" menu for more information about the app. It is possible to control more than one locomotive at a time and select different display appearances and preferences. Consult the website for more information:

https://enginedriver.mstevetodd.com/

Please note that Engine Driver, has many features that may vary according to the version that you install. WifiTrax has no control over the features of Engine Driver, but has tested carefully its operation with our product. If you have trouble working with Engine Driver and our module, please email us your problem rather than using the Engine Driver support. The author of Engine Driver may not know details of WifiTrax products, so please do not expect it. Support email: wifitrax@steveshrimpton.com or check our website.

Making it Easier Next Time

You can make connecting to the WFD-27 easier by setting your Android phone to automatically connect to the wftrx_WFD27_6_XXXXXXXX_7 access point whenever your system is powered up. This varies according to the Android version. Once this is done, when you turn on your railroad power, after a few seconds your iPhone will join the WFD-27's access point.

To make this reliable, you must disable Auto-reconnect on any other Wi-Fi Access points such as your home router. You can always enable it again when you have finished your model railroad session.

The WiThrottle app has an option "Auto-Connect to First WiThrottle Server" on the Preferences menu. If you enable that, Engine Driver should connect as soon as you power up your WFD-27.

Use the recent option when selecting locos to save typing the DCC address each time, but please read the section "Locomotive Roster Web Page" to find out about defining rosters that you can pick from.

It is a good idea to always release locomotives before powering down your WFD-27. If for some reason you can't select a locomotive, just restart the Engine Driver app.

There are other options to make things easier described in the section "Advanced Features". You can install the WFD-27 onto your Home Net, so you can operate and access the internet, control turnouts etc. at the same time as driving trains.

Getting Started with TCS UWT-100

(1) Make sure power is on to your WFD-27, the DCC Track output is connected and there is a locomotive on the track with a DCC address that you know. Both the red power LED and the blue Cab Bus indicator LED should be alight constantly.

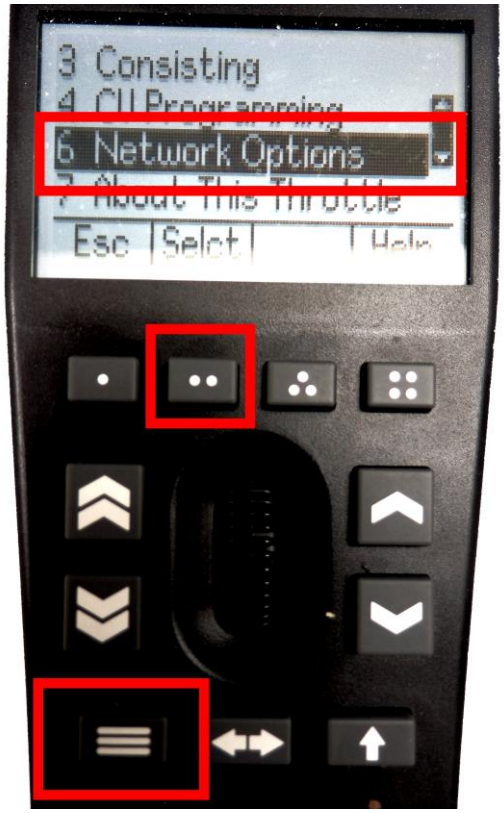


Figure 20Selecting the Network Options menu on the UWT-100

(2) Press the Menu button on your UWT, then use the up/down chevron buttons to choose Network Options, then press the Selct button [..] to open the Network menu as in Figure 20.

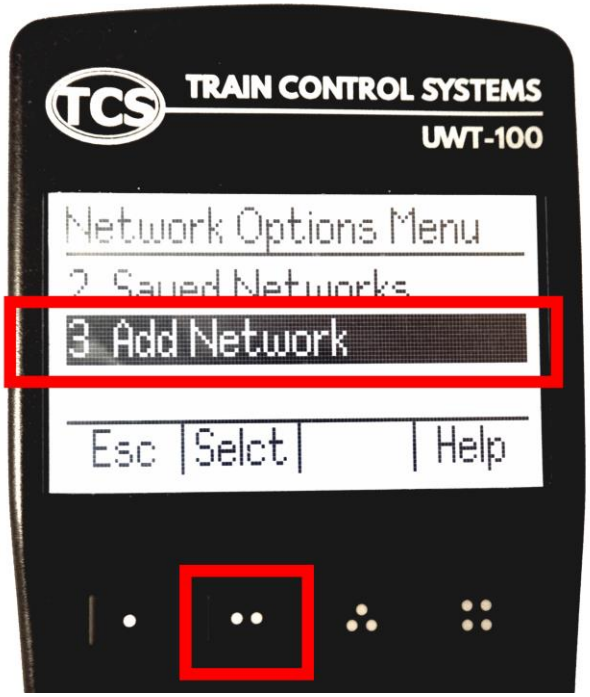


Figure 21 Select the Add Network option

(3) Select option 3, Add Network as Figure 21

Figure 22Select Scan for Wi-Fi

(4) Select option 1, Scan for Wi-Fi as Figure 22.

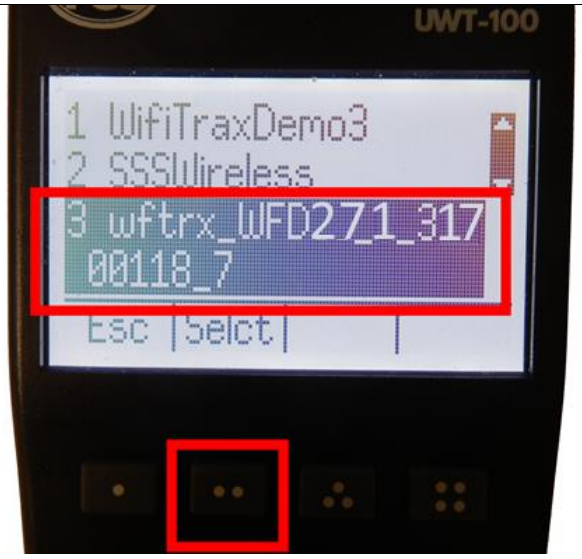


Figure 23 Select the Wi-Fi Network of the WFD-27

(5) In the Found Networks list, identify the one which has the form wftrx_WFD27_1_XXXXXXXX_7, where XXXXXXXX is the serial number of your unit as Figure 23. Select that Network, using the Selct [..] key.

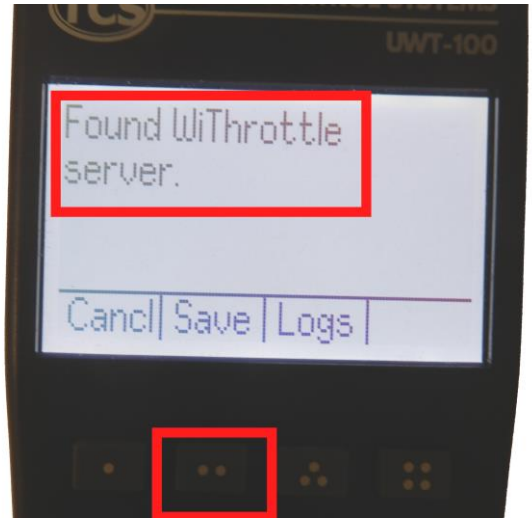


Figure 24 The WFD-27 WiThrottle server has been found. Now save it!

(6) There will be a number of messages appear but eventually you should see the message “Found WiThrottle Server” as Figure 24. Press the Save [..] key.

(7) Briefly, the message “Connected to wftrx_WFD27_1_XXXXXXXX_7 should appear. The green network LED on your WFD-27 should now flash regularly to show that the UWT-100 is communicating with it.

Figure 25 Select a locomotive with a known DCC address

(8) Press the Locomotive button on the keypad. Type the DCC address of a locomotive on your layout, followed by the Enter key as Figure 25
(9) The DCC Address should show in the top left of your screen.
(10) Test the lights, horn and bell using the HLght, F2 and F1 buttons (if your loco has sound). Verify that the loco moves forward and backwards using the Up/Down chevron buttons and the thumb wheel. Test the Emergency Stop too! Each time you make a change to the locomotive's state, both the green network LED and the blue Cab Bus LED will flash.

Advanced Features

The WFD-27 Setup Web Pages

The WFD-27 unit provides setup of advanced features via a set of web pages that may be accessed via any browser or from within apps using WiThrottle protocol and an in-built browser such as Engine Driver and WiThrottle (full). Note that WiThrottle Lite does NOT provide this feature, but you can use Safari instead on an Apple device. Please understand that this is NOTHING TO DO WITH THE INTERNET OR THE WORLD WIDE WEB! The web pages are served **from the WFD-27 itself** so you do not need to be connected to the internet. The WFD-27 just uses the same protocol as the internet: HTTP and HTML.

Setup Advanced Features using Engine Driver

(1) Connect to the Wi-Fi Access Point that your WFD-27 is using.
    a. If you are working in direct mode, that is you have not set up a home net yet, connect to the wftrx_WFD27_1_XXXXXXXX_7 Wi-Fi access point using the Settings App on your Android device.

b. If you are working in Home-Net mode, you need to connect to your home Wi-Fi network.

(2) Run Engine Driver and on the Connect to Server page select the SNXXXXXXXX entry in the Discovered Servers list. If you have changed the module name, your new module name will appear in this list instead.

(3) Tap the "three dots" icon at the top right of the screen and select Web in the menu. You should now see the Web Setup Main Menu as in Figure 26. You can click or tap on any of the headings in the menu to access the setup for that feature. The section "Setup Advanced Features using a Browser" provides information about all of the menu options.

Setup Advanced Features using WiThrottle (Full)

(1) Connect to the Wi-Fi Access Point that your WFD-27 is using.

a. If you are working in direct mode, that is you have not set up a home net yet, connect to the wftrx_WFD27_1_XXXXXXXX_7 Wi-Fi access point using the Settings App on your Android device.

b. If you are working in Home-Net mode, you need to connect to your home Wi-Fi network.

(2) Run WiThrottle and the Connect to Server will display. Select the SNXXXXXXXX entry in the Available WiThrottle Servers list. If you have changed the module name, your new module name will appear in this list instead.

(3) You now should see the WiThrottle Address page. At the bottom there should be four tabs Throttle, Address (highlighted in blue), WebServer and Settings. Tap on the WebServer tab and you should now see the Web Setup Main Menu as in Figure 26. You can click or tap on any of the headings in the menu to access the setup for that feature. The section "Setup Advanced Features using a Browser" provides information about all of the menu options.

Note that WiThrottle Lite does not have this WebServer tab so if you are using the Lite version you will have to use Safari as described in the section "Setup Advanced Features using a Browser"

Setup Advanced Features using a Browser

(1) On your hand-held device or computer open a browser such as in Table 2.

Device	Operating System	Browser Options
iPhone, iPad	IOS	Safari
Android Tablet or Phone	Android	Chrome
Windows Computer	Windows XP, 7, 8, 10	Internet Explorer, Edge, Chrome etc.

Table 2 Web Browsers available on different platforms

(2) If you are working in Direct Mode, connect your device to the Wi-Fi Access Point of your WFD-27, that is wftrx_WFD27_1_XXXXXXXX_7, where XXXXXXXX is the 8-digit serial number. If you are working in Home Net mode you do not need to do this.

(3) Type the URL of the WFD-27 into the Address Bar of the browser.

a. In Direct Mode type 192.168.7.1 and hit the enter key or "Go" button (the http:// may appear automatically. Do NOT use "https" (the WFD-27 does not support secure sockets).

b. In Home Net mode, type the IP Address that was assigned by your router and hit the enter key. Please see the section “Tips to Manage your Home Network” to see how to find this out.

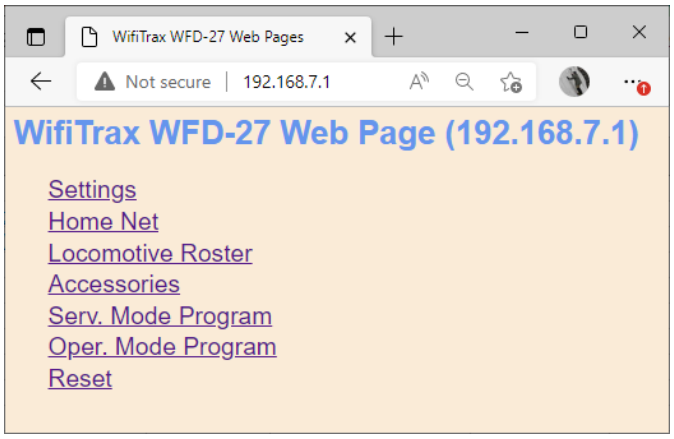


Figure 26 The WFD-27 Web Setup Main Menu

(4) You should now see the Web Setup Main Menu as in Figure 26. You can click or tap on any of the headings in the menu to access the setup for that feature.

General Settings Web Page

To modify General Settings, tap the Settings heading in Figure 26.

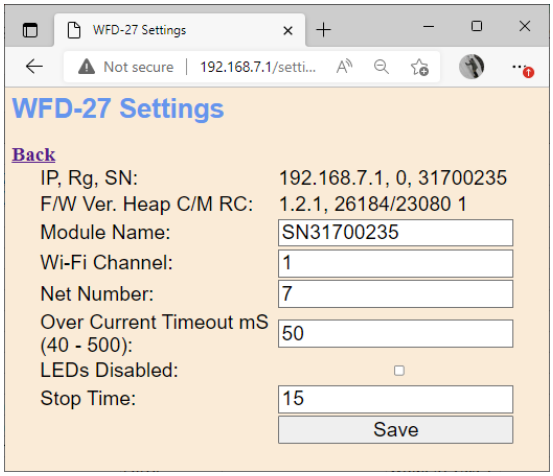


Figure 27 The WFD-27 General Settings Web Page

IP Address

If you are working in direct mode this will display 192.168.7.1. If you are in Home-Net mode it will display the IP Address assigned by your router. You cannot change this from the Settings page but you may want to take note of it since that is the IP address you need if you want to use a browser to access these pages, but remember that the router may change this unless you set up a reservation (Please see the section “Tips to Manage your Home Network”).

Firmware Version

This is the version of the WFD-27 firmware installed at the factory. You cannot change this but if you request WifiTrax support, you may be asked for it. If you upgrade the firmware, this will show the version you installed.

Module Name

This defaults to the value SNXXXXXXXX where the X's are the 8-digit serial number. You can change this to a name up to 10 characters long which cannot include spaces. Type the name you want in the text box (such as "Wi-Fi_DCC") and tap Save. After cycling power, this name will appear to all apps using WiThrottle protocol such as Engine Driver and WiThrottle as the name of the discovered WiThrottle Server.

Wi-Fi Channel

This is the Wi-Fi channel in the 2.4GHz Wi-Fi band that the WFD-27 will use when operating in Direct Mode. It will have no effect in Home Net mode as the channel will be determined by your router. You can set the channel to a value from 1 to 13 (1 – 11 North America) and the default value is 1 after a factory reset. You do not normally need to change this but it may be helpful if other interfering Wi-Fi devices are being used nearby and thus limiting bandwidth. You need to cycle power before the channel change will have an effect. Once you have cycled power, the WFD-27 Wi-Fi access point will be of the form wftrx_WFD27_N_XXXXXXXX_7 where N is your selected channel.

Note: Only channels 1 to 11 may be used in North and South America, 1 to 13 may be used in Europe and Asia/Pacific. It is your responsibility to avoid breaking the law by adhering to these conditions.

Net Number

This defines the subnet that the WFD-27 will use to set its own IP Address and to allocate IP Addresses to hand-held devices that connect in Direct Mode.

It has no effect in Home Net mode.

If you change this value, by typing an integer from 1 to 14 and tapping Save, the WFD-27 will use this after cycling power. The subnet will be 192.168.N.0 where N is the net number. The unit's IP Address will then be 192.168.N.1 and it will assign IP Addresses: 192.168.N.2 to 192.168.N.5 to connecting devices.

The WFD-27 Wi-Fi access point will be of the form wftrx_WFD27_1_XXXXXXXX_N where N is your selected net number.

Over-current Timeout

This sets the period of time in milli-seconds (1 milli-second or mS = 1/1000 of a second) that the module will allow a current exceeding 6 amps before shutting down the DCC output. If a short occurs on the track, the module will shut down its DCC output and the blue LED will flash. After a short period of time the module will try again and, if the short persists, will shut down again. This sequence continues until the short is removed.

The default timeout is 50mS but you may increase this up to 500mS (= 1/2 second). This may be necessary when using a reverser that is intended to detect a short as a locomotive crosses a gap and reverse the DCC supply to a section of track. Examples are return loops, wyes and turntables. If the WFD-27 timeout is set too short, it may cut off DCC power before the reverser has a chance to reverse the supply and thus remove the short. Take care not to make this timeout setting any longer than that necessary for the reverser to operate. A long timeout may cause overheating and damage when a genuine short occurs. **Take care to maintain vigilance and avoid any possibility of a fire! Do not leave your system running unattended.**

Another point to be aware of, is that if the over-current timeout is made long, the power adapter supplying the unit may shut down or the voltage may drop before the WFD-27 shuts down so that the WFD-27 firmware crashes. In this case you need a complete power down to restart.

Stop Time

This is not effective in the current firmware version. Please ignore this setting.

Home Net Web Page

This page allows you to change your WFD-27 from Direct Mode to Home Net Mode and back again. Once you have changed to Home-Net mode, you will not be able to work in Direct Mode, but if for some reason the WFD-27 cannot join your Home Net (maybe you typed it wrong, put in the wrong password or the router was turned off), the WFD-27 will attempt to connect for about 30 seconds then revert to Direct mode. You will then see the wftrx_WFD27_1_XXXXXXXX_7 access point which you can connect to and correct the problem. It's always worth restarting your home router if you've checked everything and connection does not succeed, as these do seem to get locked up somehow!

To change to Home Net mode, tap the Home Net heading in Figure 26.

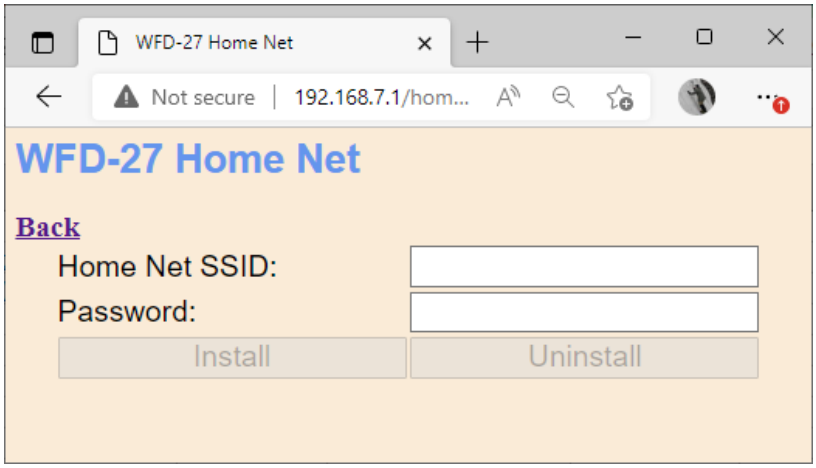


Figure 28 The Home Net Web Page

Figure 28 shows the Home Net web page. Type the SSID of your home Wi-Fi router in the Home Net SSID textbox. Type the password (sometimes called shared key) for your home Wi-Fi Access Point into the Password textbox. Be careful as passwords and SSIDs are case sensitive. Also make sure you don't add any leading or trailing spaces accidentally. Check the section "Tips to Manage your Home Network" to find some tips on finding out your SSID and password. This will often be provided by your internet service provider on a card, but you may have changed it.

When you are satisfied these are correct, tap "Install". The unit will restart and connect to the Home Wi-Fi Network you have specified. **The green LED will illuminate constantly to indicate successful connection.** To continue, you must reconnect your phone, tablet or computer to your home network and use the WFD-27's IP Address on that network.

To obtain the roster and drive trains when operating in Home Net mode, make sure your phone/tablet device is connected to your home net, then run Engine Driver or WiThrottle. Select the WFD-27 WiThrottle server (e.g. SNXXXXXXXX) from the Discovered Servers list.

If you need to manually configure using the IP Address assigned to the WFD-27 module, please see the section "Tips to Manage your Home Network" to find out the IP Address and to set your router

so it always assigns the same address. Once you have connected to the server, the operation of Engine Driver and WiThrottle is the same as in Direct mode.

To access the web pages, you need to use the IP address that has been allocated to the WFD-27 by your router instead of the fixed 192.168.7.1 address in direct mode. Engine driver provides a menu item to access the web page, and WiThrottle – Full Version shows a tab at the bottom. Once you have the web pages, you can take a note of the IP Address from the settings page. Again, it is best to assign a reserved IP address in your router.

Locomotive Roster Web Page

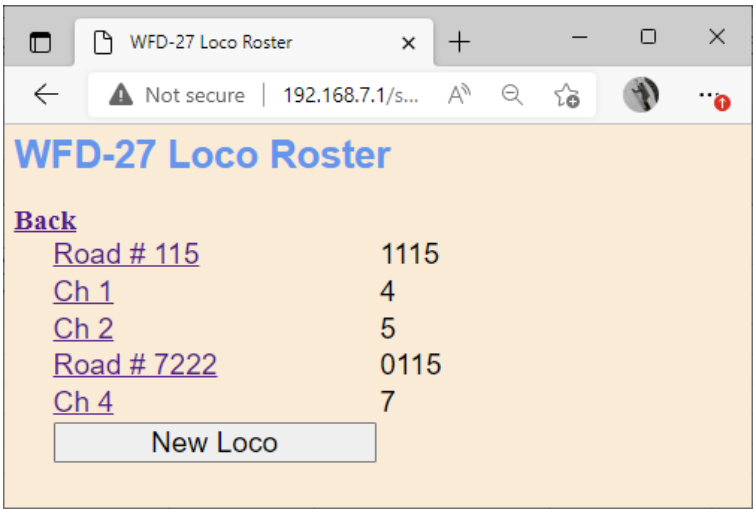


Figure 29 The Locomotive Roster Page

The Locomotive Roster page allows you to change the entries in the locomotive roster of your WFD-27. You can give each entry a Name and a DCC Address. **You can then select from the roster when using Engine Driver or WiThrottle instead of needing to type the DCC Address. You can also name the function keys to match the usage by your DCC decoder and loco.**

View the Locomotive Roster by tapping that option in the Main Menu. By default, as shipped, and after any factory reset only four entries are displayed and given the names “Ch 0” through “Ch 3” with DCC Addresses 3 through 6. To edit one of the entries, tap the name, to show the edit page as Figure 30, then enter what you require in the Name and DCC Address text boxes and tap Save. **Names can be up to 15 characters and may contain spaces. DCC addresses must be in the range 1 – 9999.**

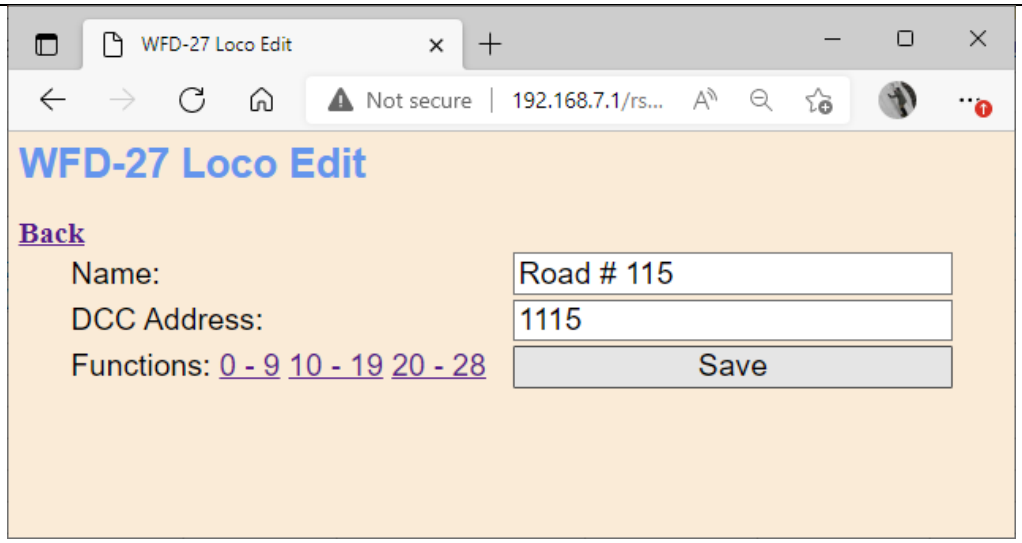
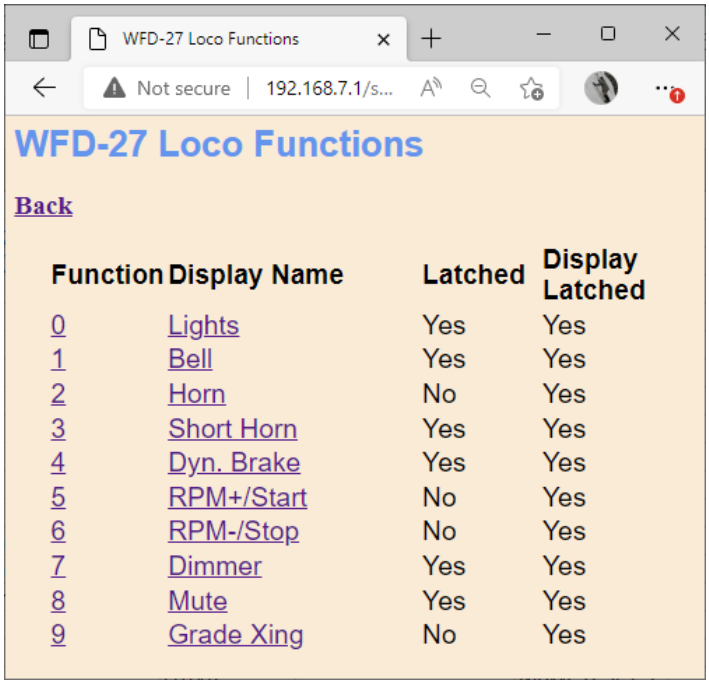


Figure 30 The Locomotive Roster Entry Edit Page. You can also access the Function labels from here.

Function Labelling Web Page

If you want to add function labels, go back into the edit page for the required loco and tap the Functions hyperlink, either "0 – 9", "10 – 19" or "20 – 28". The selected range of functions is displayed for that locomotive as in Figure 31.



Function	Display Name	Latched	Display Latched
0	Lights	Yes	Yes
1	Bell	Yes	Yes
2	Horn	No	Yes
3	Short Horn	Yes	Yes
4	Dyn. Brake	Yes	Yes
5	RPM+/Start	No	Yes
6	RPM-/Stop	No	Yes
7	Dimmer	Yes	Yes
8	Mute	Yes	Yes
9	Grade Xing	No	Yes

Figure 31 Examples of the function labels displayed for a given locomotive that has been set up for a certain decoder.

To edit any function, tap the name of the function and change its name in the textbox. **The name can be up to 10 characters long.** You can also change whether the function is latched or not using the "Latched" checkbox. When a function is latched, the WFD-27 will send a 1 value to the locomotive decoder when the key is first tapped, then a 0 value when it is tapped a second time. For unlatched functions a 1 is sent when the button is pressed and a zero when released. There is also a "Show Latched" checkbox that is occasionally useful. We have found some DCC decoders seem to

perform the function once on each transition, so sometimes it is useful to mark a function as latched but to display is as though it were not latched.

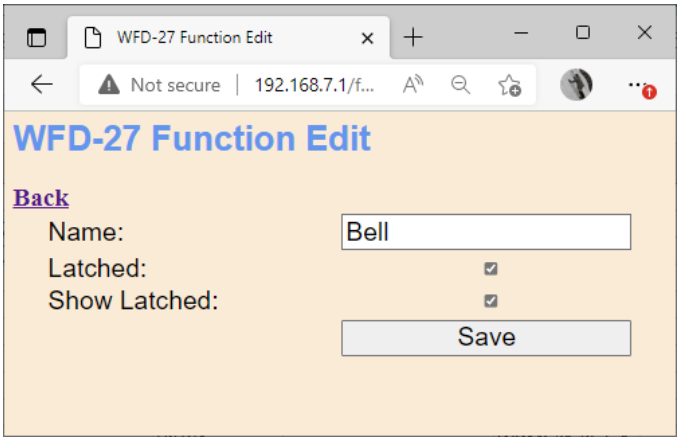


Figure 32 Editing a function key for a given locomotive

You can add more locomotives to your roster up to a maximum of 16. Add a loco by tapping the "New Loco" button on the Loco Roster page. A new loco will be added with a default name, DCC address and set of functions. Once you reach 16, tapping the New Loco button will have no effect. **You can, of course operate any number of locomotives simply by typing the DCC address in the app. Instead of selecting from the roster.**

Currently it is not possible to remove locomotives from the roster, other than by doing a factory reset.

Accessories

The Accessories page, accessed from the main menu by tapping the option of that name, is shown in Figure 33. This allows you to name up to 32 accessories (usually points) that will be listed on the device used as a throttle. You can, of course operate any number of accessories simply by typing the DCC address in the app. Instead of selecting from the list.

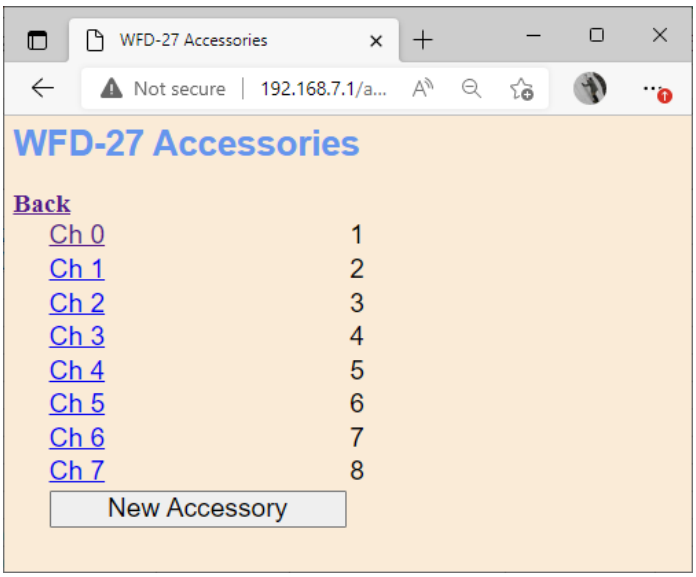


Figure 33 The Accessories List

By default, after factory reset, eight accessories are included, but this may be extended up to 32 by tapping the New Accessory button. Accessories will appear on the WiThrottle and Engine Driver apps and can be controlled there as well as from the UWT 100 from TCS. Accessories cannot be deleted other than by doing a factory reset.

You may name any accessory by tapping on its name in the list to display the Accessory Edit page in Figure 34.

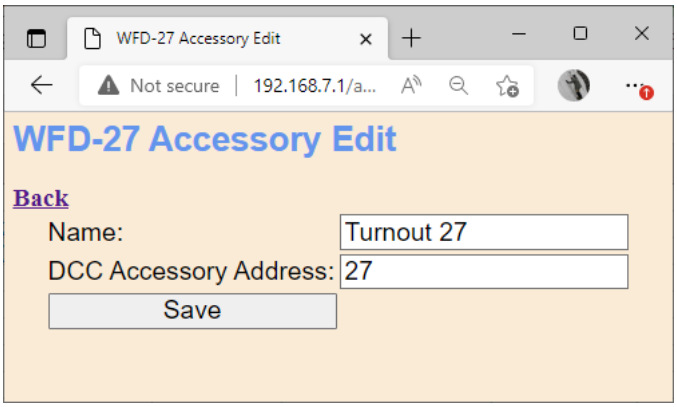


Figure 34 The Accessory Edit page

Here you can change the name and the DCC Accessory Address. Tap Save to commit the results. **Accessory names may be up to 10 characters long and may include spaces.** Accessory addresses must be 1 to 9999.

Service Mode Programming

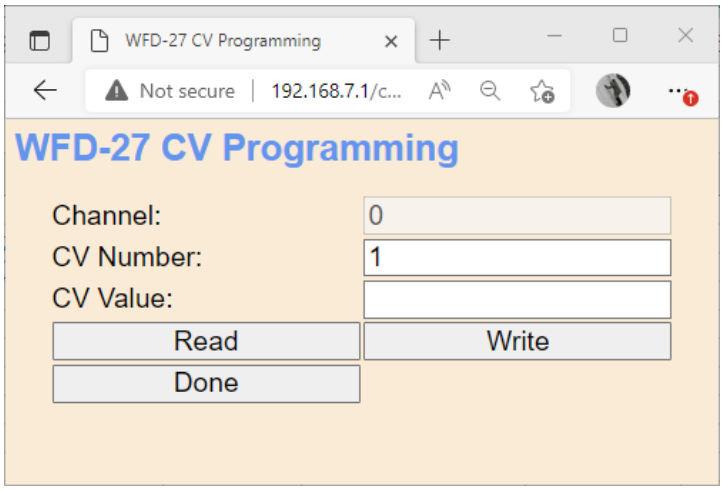


Figure 35 The Service Mode Programming (Programming Track) page

The WFD-27 provides a Program Track output of DCC. The program track is used to program the CVs of one locomotive at a time. CVs can also be read from the locomotive on the program track.

Display the Service Mode Programming screen, in Figure 35, by selecting that option from the Main Menu. Locomotives **cannot** be driven when service mode programming is in process (and the Channel textbox is not applicable to Service Mode programming).

To read a CV, type the CV number in the textbox labelled CV Number, then tap the Read button. After a short period of time, the CV Value will appear in the text box to the right of that label. Note

that, if more than one loco is present on the programming track, the CV value read will be indeterminate. Also, you should keep the wires to the program track short to avoid noise which might affect the read process.

To change the value of a CV, type the CV number or use the same number just read, then type the new CV value and tap the Write button. After a short period of time the CV will be written and a confirmation value read back.

When you have finished CV programming, tap the Done button to return to the main menu.

Note: It has been reported that the WFD-27 does not read CV values correctly with some decoders, e.g., the Lenz Standard+ V2 and possibly others. In this case the value zero is returned. The write function however, operates correctly in these circumstances.

Operational Mode Programming (Programming on the Main)

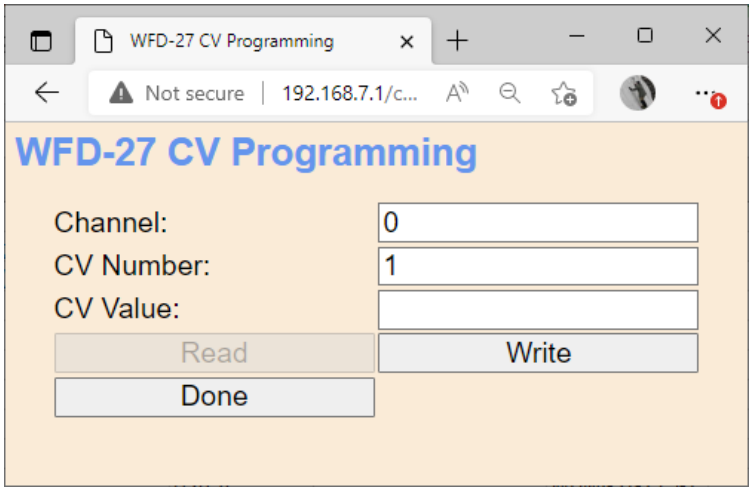


Figure 36 The Operational Mode Programming (Program on Main) page

The WFD-27 allows programming of CVs on the main track. Here the locomotive is programmed by using its current DCC Address, so more than one locomotive can be present on the main track and only the addressed loco will be programmed. Reading of CV values is not possible in this mode.

Display the Operational Mode Programming screen, in Figure 36, by selecting that option from the Main Menu. Locomotives **can** be driven when operational mode programming is in process. **You can only program locomotives that are in the roster of the WFD-27, up to 16 locomotives.**

To select a loco for programming, you must enter its channel number in the Channel textbox. Take note of this from position on the Roster page.

To change the value of a CV, type the CV number and type the new CV value in the labelled textboxes, then tap the Write button. The CV will be written to the locomotive's decoder and usually take effect immediately (depending on its function). A good test is to change the master volume. Check your decoder documentation to determine that CV number and its acceptable range of values.

When you have finished CV programming, tap the Done button to return to the main menu.

Factory Reset

You may factory reset your WFD-27 by selecting the Reset option on the main menu page. You will be asked to confirm the reset and then the unit will immediately revert to its factory configuration. All the settings will take their default values and Home Net settings will be removed. The locomotive roster and Accessory List will return to their default values and any changes that you made will be lost.

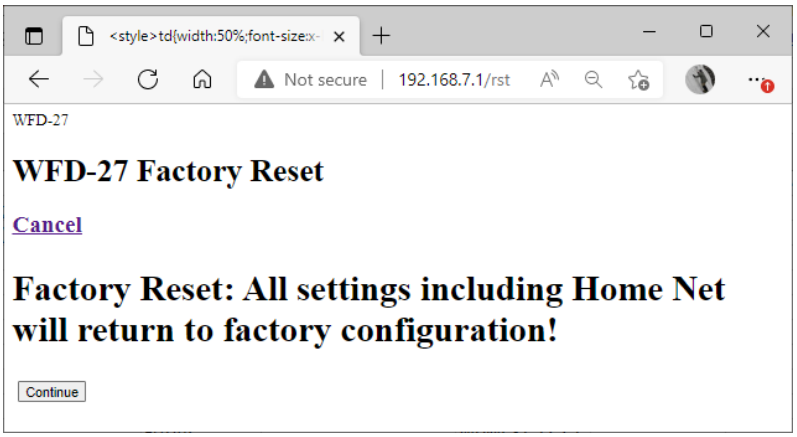


Figure 37 Factory reset confirmation page

Mounting Suggestions

The WFD-27 is supplied as a bare module and **no part of it must be permitted to touch any metal**. **If any part is allowed to touch live rails for example, it is likely that the unit will be damaged beyond repair.** For this reason, it should be mounted properly before use. Two options are suggested here.

(1) Use the mounting kit to attach the module to your baseboard or fascia, as in Figure 38, either on top or underneath in such a way as to avoid anything being placed on it or against it.
(2) Mount the module inside a suitable plastic box with holes cut to accommodate the wires to track. **Do not use a metal box** as this will cause degradation of the Wi-Fi performance.

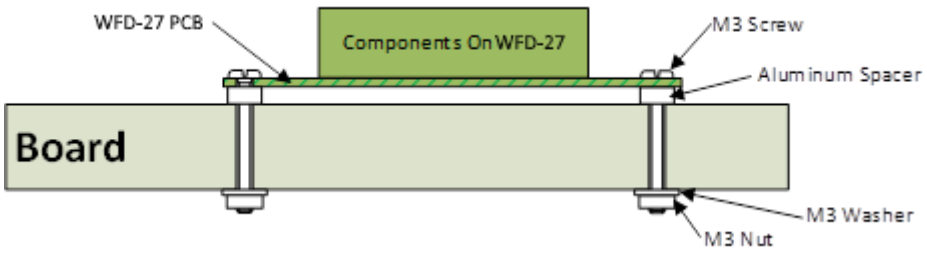


Figure 38 Mounting the WFD-27 on a board

Operating your Accessories

The WFD-27 provides the ability to configure DCC Accessories as described in the section "Accessories", by default there are 8 configured with default names and DCC accessory addresses.

Once configured, accessories, will be provided to WiThrottle or Engine Driver when either of those apps connect to the WFD-27 as a WiThrottle server. Both of these apps provide a display of named accessories in list form. Only two-state accessories, displayed as turnouts, are supported and you

can change the state of a turnout by tapping it in the list. Alternatively, these apps provide capability to type an address and Throw, Close or Toggle the turnout.

On Engine Driver, the Turnouts are displayed by swiping left or right or selecting from the "3-dots" menu. On WiThrottle, the turnouts are displayed by swiping right on the Throttle page.

Tips to Manage your Home Network

Connection to your Home Router

When you set a WFD-27 module to Home-net mode, it will immediately restart and try to connect to the Wi-Fi Access point that you specified in the SSID, using the password that you supplied. From then on, it will try to connect each time you power on. If the connection is unsuccessful, after about 30 seconds it will keep trying but re-enable Direct mode to allow you to connect and either correct the problem or return it to Direct mode. Usually, failure to connect occurs because the password or SSID is incorrect, so you would need to double check that, but it might be because your home router is too far away or is turned off.

Sometimes routers refuse connections because there are not enough IP addresses, within the router assigned to the network. Sometimes some internal hang-up problem seems to occur so routers need to be restarted from time to time. Also, occasionally there are so many people operating Wi-Fi devices in an area that there is just too much radio traffic. In this case changing the router to a different channel may work. Remember that in Home-net mode, the WFD-27 always uses the Wi-Fi channel of the router to which it is connected.

Home Net IP Address Assignment

Every device connected to a network needs an IP Address and when your WFD-27 successfully connects to your home router, the router will allocate it an IP Address from a list of unused addresses. This process is called DHCP (dynamic host control protocol) and you can Google the term to find all the information you would like. IP Addresses are leased to connected devices and it is possible that the next time you turn on your WFD-27, the lease will have expired and the router will give it a different IP Address. Also, when a router is restarted, it is likely to give out a different IP Address to each client.

This changing IP Address does not matter if you are using 3rd-party apps using the Hoffman WiThrottle protocol (like Engine Driver and WiThrottle) because they discover one or more WFD-27 modules using a protocol called Multicast DNS. The WFD-27 broadcasts its presence, with its information, to all devices connected to the network, and the Engine Driver and WiThrottle apps display WiThrottle servers found in this way in their list of discovered servers. You then connect to your choice of WiThrottle server when you start the app.

If you want to access your WFD-27 from a browser such as Internet Explorer, Edge, Chrome or Safari, you need to know its IP Address. There are several good ways of finding the IP Address assigned by your router.

(1) Once you have connected using an app such as WiThrottle or Engine Driver, you can use the "Web Page" menu item or tab to view the Settings page as in section "General Settings Web Page". Once you see the IP Address, you can make a note of it and type it into a browser as in section "Setup Advanced Features using a Browser".

(2) Probably the best way is to visit the Admin page of your router. To do this, type the address of your gateway into a browser. You can find this on Windows by opening a Windows command console and typing the ipconfig command:

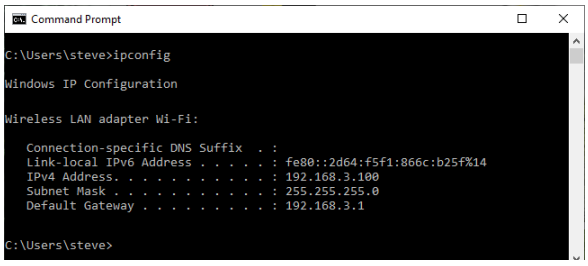


Figure 39 Using ipconfig to find your computer's IP address and default gateway

(3) Figure 39 shows the result. Now take the default gateway IP Address, 192.168.3.1 in this example. and type it into the address bar of your favorite browser, then hit the Enter key.

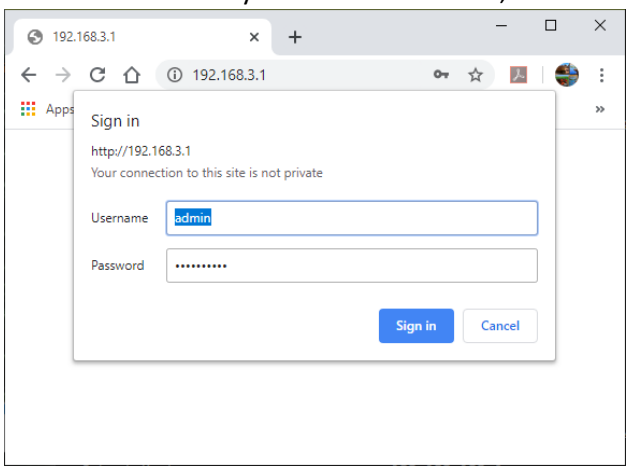


Figure 40 Access your router by using the IP Address of your default gateway in a browser

(4) The browser will ask for your username and password to access your router's admin page. You can find this in one of these places, unless you have changed it:

a. A sticker on your router, at the back or underneath. Look for the Admin user name and password (this is not always the same as your Wi-Fi password),
b. On a card supplied by your internet service provider or telco,
c. In the leaflet that came with your router.

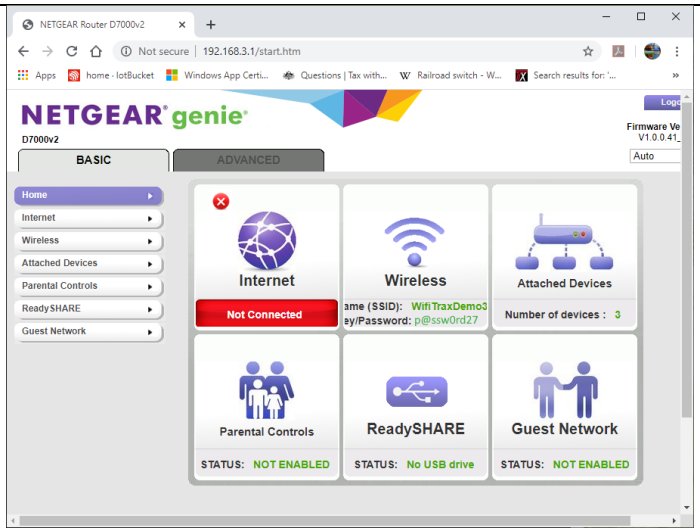


Figure 41 A typical router admin page

(5) Once you have given the credentials, you will see the admin page. A typical one is shown in Figure 41. Find the “Attached Devices” option and click on it.

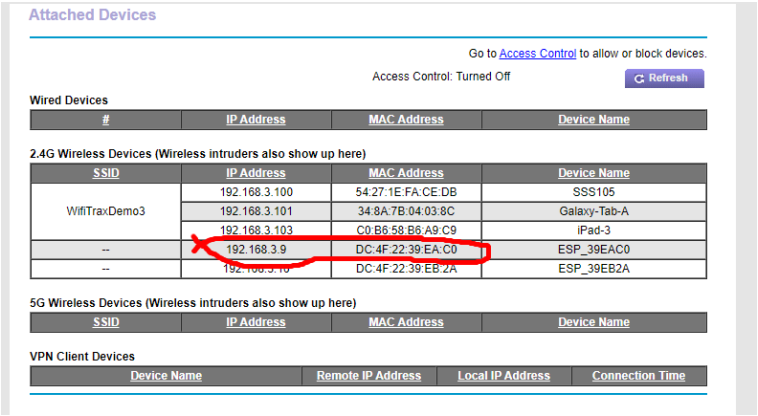


Figure 42 Typical "Attached Devices" page of a router

(6) You will see a screen something like Figure 42. Find the row where the MAC address matches that printed on the bag label of your WFD-27 device. Here the MAC Address `DC:4F:22:39:EA:C0` matches the STA MAC Address on the bag label, so the IP Address is `192.168.3.9`

(7) Now open another tab in your browser and type the IP Address, `192.168.3.9` in this case, into the address bar to get the main menu web page.

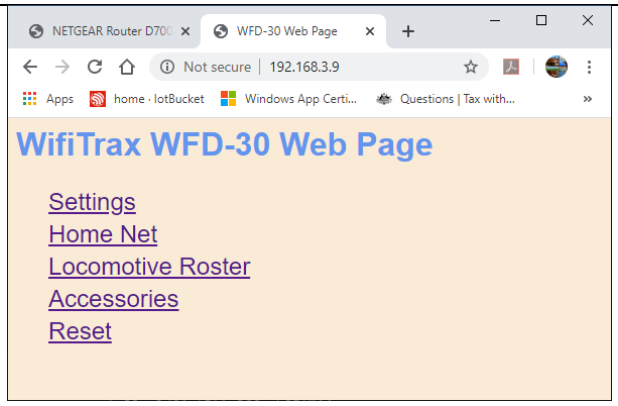


Figure 43 Use the IP Address to open the main menu web page

Reserving a Fixed IP Address

That's all well and good but earlier it was said that routers do not always assign the same IP Address!

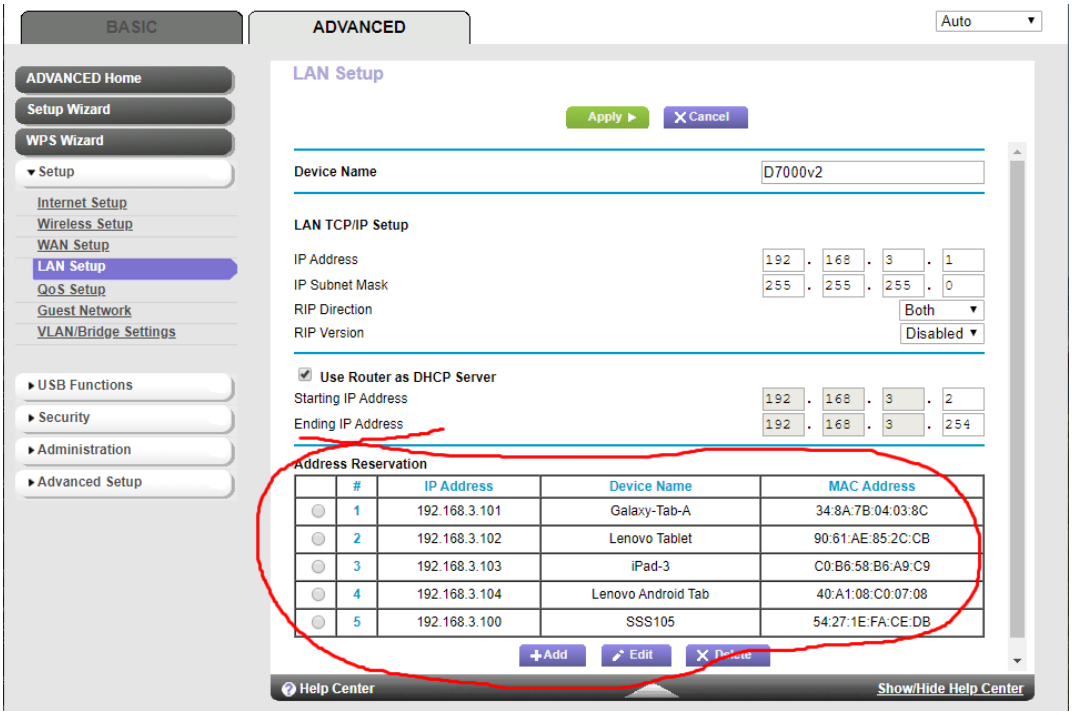


Figure 44 An IP Address reservation table in a router

Well, while you're in the router admin page you can *reserve a fixed IP Address* for your WFD-27 module. In the Netgear D7000v2 that is used here as an example, you need to click the Advanced tab, then the Setup menu and the LAN Setup sub-menu. The table at the bottom of Figure 1 shows the Address Reservation Table. In this router, you can see that there are already 5 reservations and to add a new one, we hit the Add button.

Then type in the information from Figure 42, give the reservation a name "WFD-27" and hit Add as Figure 45.

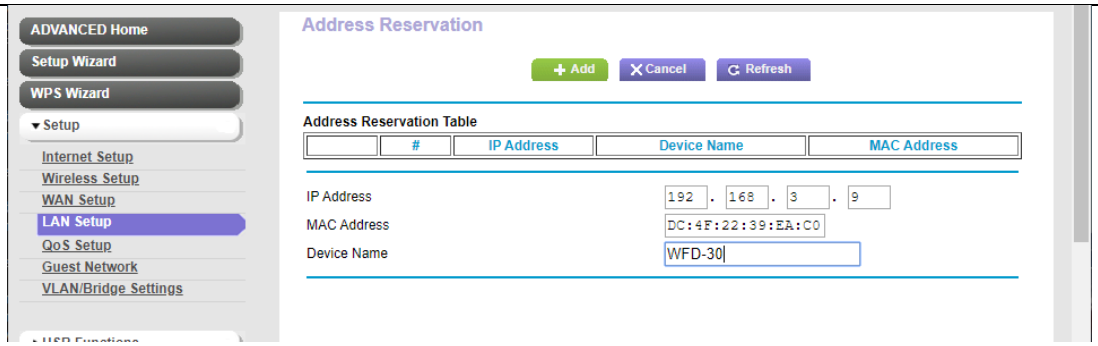


Figure 45 Adding an address reservation

Usually you have to click the Apply button to restart the router, then check the reservation page to make sure the new one is there. Now your module will always have the same IP Address.

More Information

Article about Wi-Fi/DCC:

http://www.wifitrax.com/appNotes/WiFi-DCC.pdf

Access all the articles:

http://www.wifitrax.com/appNotes/howToArticles.html

FCC Information

Radio or TV Interference (this information is MANDATED by the FCC)

This equipment incorporates Espressif Wi-Fi Transceiver Module ESP-WROOM-02D.

FCC Identifier: 2AC7Z-ESPWROOM02D.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help. **Note that any modifications to the equipment not expressly approved by WifiTrax voids the user's authority to operate under and be in compliance with CFR 47 rules**, as administered by the Federal Communication Commission. WifiTrax believes any conscientiously installed equipment following guidelines in this manual would be unlikely to experience RFI problems.

For Canadian Users: "This digital apparatus does not exceed the Class B limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation or the Canadian Department of Communications." Le present appariel numerique n emet pas de bruits radio-electriques depassant les limites applicables aux appareils numeriques de la classe B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

EU Declaration of Conformity

1. Radio equipment: WifiTrax Model WFD-27 Wi-Fi/DCC Trackside Command Station/Booster

2. Name and address of the manufacturer or his authorised representative:

WifiTrax Model Science (A business owned by Steve Shrimpton Sciences Pty. Ltd. a company registered with the Australian Securities and Investments Commission ACN: 076 070 258)

116 The Gully Road, Berowra NSW 2081 Australia

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration:

WifiTrax Model WFD-27 Wi-Fi/DCC Trackside Command Station/Booster as pictured in Figure 46 and identified by a label on underside of module bearing the model number WFD-27.

Figure 46 Identifying Illustration for WifiTrax Model WFD-27 EU Declaration of Conformity

5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation: Directive 2014/53/EU

6. Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the EU declaration of conformity:

ESP-WROOM-02D Wi-Fi Internet of Things Module, Espressif Systems (Shanghai) Co., Ltd.

EU-type Examination (Module B) Certificate No. 192140277/AA/00

Issued by Telefication BV the Netherlands, Chamber of Commerce 51565536, www.telefication.com

7. Additional information:

Manufacturer has undertaken engineering analysis and appropriate testing to determine the subject of this declaration performs in its electromagnetic characteristics in the manner specified for the radio module identified in item 6 above.

Module is configured for EU market to allow Wi-Fi Channels 1 through 13 in the 2.4GHz Wi-Fi band.

Signed for and on behalf of: WifiTrax Model Science September 23, 2022, Berowra NSW Australia

Stephen J Shrimpton, Chief Engineer, Director